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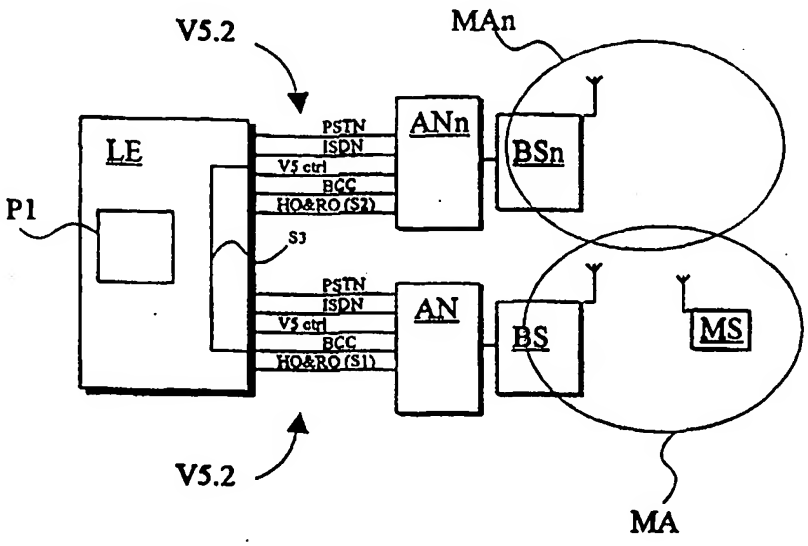

(57) Abstract

The present invention relates to a procedure and a system that allows a better mobility for a mobile station (MS) in a wireless local loop. The invention enables the mobile station's mobility area (MA), defined by the home base station (BS) or home cell of the mobile station, to be extended to the areas of other base stations and/or cells connected to the same local exchange (LE).

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PROCEDURE FOR EXTENDING THE MOBILITY OF A WIRELESS SUBSCRIBER'S STATION

The present invention relates to a procedure as defined in the preamble of claim 1 for extending the mobility of a wireless subscriber's station. Moreover, the invention relates to a system as defined in the preamble of claim 13 for extending the mobility of a wireless subscriber's station.

In a wireless local loop (WLL), a terminal device is connected via a wireless link to an access node (AN). Between the terminal device and the access node there is a base station, through which call signals sent by the terminal device over a radio channel are transmitted via the access node to a public telephone network and vice versa. The access node is connected to the telephone exchange using the V5.1 or V5.2 protocol.

Open interfaces (V5.1 and V5.2) between an access node and a local exchange are defined in the ETSI (European Telecommunications and Standards Institute) standards of the ETS 300 324 and ETS 300 347 series. V5 interfaces enable subscribers belonging to a physically separate local network, either wired or wireless, to be connected using the standard interface of the telephone exchange. A dynamic concentrator interface V5.2 consistent with the ETS 300 347-1 and 347-2 standards, consists of one or more (1 - 16) PCM (Pulse Code Modulation) lines. One PCM line contains 32 channels, each with a transfer rate of 64 kbit/s, i.e. 2048 kbit/s in all. The V5.2 interface supports analogue telephones as used in the public telephone network, digital subscriptions, such as ISDN (Integrated Services Digital Network) basic and system subscriptions as well as other analogue or digital terminal equipment based on semi-fixed connections.

In present-day wireless systems, extending the mobility of a subscriber's station is not possible and/or it is at least very difficult. When the subscriber's station is connected to a wired-network WLL subscriber line and the subscriber wishes to be temporarily accessible from outside the area of his/her home own base station or home cell, the subscriber must hire, buy or borrow a mobile telephone of a GSM operator. In more advanced systems the subscriber's station, such as a mobile station, contains two subscriber identity modules (SIM), one of which has been defined for operation in a GSM network and the other in a WLL environment of a wired telephone network. In this case, the subscriber makes a selection via his/her terminal device as to the network to be used. It is also possible that, in a system based on the GSM/DCS technology, the subscriber's station contains a technical solution based on both systems. In this case, too, the subscriber selects the network to be used via his/her subscriber's station.

WLL access nodes connected to a local exchange via a V5.2 interface are not able to transmit the signalling data typical of the GSM system over a V5 interface to other access nodes or to a mobile communication network. With the prevailing technology, extending the mobility of WLL subscribers to another WLL access node of the same wired-network exchange, to a WLL access node of another wired-network exchange or to a GSM system mobile switching centre is impossible.

The object of the present invention is to eliminate the problems described above. A specific object of the present invention is to disclose a new procedure and a new system that make it possible to implement the mobility of a subscriber's station even in a wireless local loop.

As for the features characteristic of the present invention, reference is made to the claims.

The present invention concerns a procedure for extending the mobility of a terminal device in a wireless local loop environment. For the sake of clarity, let it be stated that 'terminal device' in this application can refer to the physical device itself, e.g. a mobile station, or to a subscriber; for example, the mobility area defined for a terminal device means the mobility area that has been defined for the subscriber whose identity module is connected to the terminal device. The local network in question can be implemented in at least two ways: by suitably modifying a mobile communication network so as to render it usable in a wireless local loop (GSM/DCS1800), or using a system which is based on a technology (GSM/DCS1800 Access System) used in a mobile communication system and which comprises a local exchange and an access node connected to the local exchange. The access node is preferably connected to the local exchange via a V5 interface consistent with the above-mentioned standard. Moreover, the system comprises a terminal device and a base station which is connected via the access node to the local exchange and which is used to transmit call signals between the access node and the terminal device. The terminal device and the base station communicate over a radio link. Further, the home network and predetermined mobility area of the terminal device are defined by means of the base station and the associated access node in such a way that the terminal device can only establish connection with the access node via its home base station. Disposed around the access node are a number of base stations of other networks, so that the terminal device receives information signals from the surrounding base stations and, based on these information signals, determines the base station with which it is communicating, as is known from mobile communication technology.

According to the invention, a signalling channel is set up in the interface between the local exchange and the access node and this channel is used for the transmission of information related to mobility management. The signalling channel may be a time slot either permanently or dynamically reserved in the V5 interface. Further, according to the invention, when the terminal device moves out of or to the outskirts of the coverage area of its home base station, where the signal strength is low, another base station is determined on the basis of information given by the terminal device, which information may comprise e.g. a list of base stations with which the terminal device is able to establish radio communication, which other base station primarily communicates with another access node connected to the local exchange. Further, the terminal device is handed over to the other base station and the handover is registered in the local exchange in the home network. It is also possible, if the terminal device is unable to set up radio communication with the other access node connected to the local exchange, that the other base station belongs to a mobile communication network, in which case the wireless network data for the terminal device, along with possible other information, is communicated to the mobile communication network and the terminal device is installed as a temporary subscriber in the mobile communication network, thus allowing the terminal device to be used in the mobile communication network according to its normal definitions. The subscriber is dynamically established as a temporary subscriber, which is a deviation from normal GSM network management because normally the operator creates the subscriber in the HLR. A subscriber established as a temporary subscriber is treated like any subscriber in the GSM network.

As compared with prior art, the procedure of the invention has the advantage that when a subscriber is within the coverage area of the base station of his/her own WLL access node, he/she is able to utilise the normal services offered by the wired network, such as cheaper running costs, and yet the subscriber has unlimited mobility permitting handover to another access node under the same local exchange or to a mobile communication network.

Thus, the invention enables the mobility of a subscriber in a wired network to be extended with the same subscriber's station from the WLL access node to other access nodes or to a mobile communication network, so the subscriber can make an agreement with the operator about extending his/her mobility to allow handover to several WLL access nodes and to a mobile communication network.

A further advantage of the invention as compared with prior art is a uniformity of telephone numbers. This means that when a subscriber in the system of the invention is under a common mobile communication network, he/she can be reached with the normal number assigned to him/her in the wired telephone network.

In an embodiment of the present invention, a signalling channel is also created in the interface between the local exchange and a second access node, which signalling channel is used to transmit information relating to the management of the mobility of the terminal device, such as a list of those base stations to which the terminal device is able to perform a handover according to the definitions for the mobile communication network. Further, a signalling channel for the transmission of signalling between the access nodes is created in the local exchange between the first access node and the second access node. The signalling transmitted over this channel is used as an aid when

the terminal device is handed over to the second access node.

On the other hand, as it is also possible to hand over the subscriber to a mobile communication network, in one embodiment a second signalling channel is set up between the local exchange and the mobile communication network and this channel is used for the transmission of information relating to the management of the mobility of the terminal device, such as a list of those base stations to which the terminal device is able to perform a handover according to the definitions for the mobile communication network. Further, a signalling channel for the transmission of signalling between the first access node and the mobile communication network is set up in the local exchange between the first access node and the mobile communication network. The signalling transmitted over this channel is used as an aid when the terminal device is handed over to the mobile communication network.

When the subscriber has a call active and is being handed over from the subscriber's own access node to another access node connected to the same local exchange, a protocol implemented in the local exchange first selects the access node to which the subscriber is to be handed over and then assigns the subscriber being handed over a temporary V5/L3 address in the access node to which the subscriber is to be handed over. The V5/L3 address is an address that identifies a given subscriber defined in a given V5 interface. Each subscriber must have an individual V5/L3 address different from the others.

Further, the setup and scanning of a speech path under another access node for a subscriber who has been permanently defined as belonging to a different access node and who has been or is being handed over to another access node must be effected either via the normal V5/L3 address range by using addresses

set apart from normal use that do not identify a unique subscriber but a subscriber dynamically handed over to the access node according to the invention and defined as a subscriber in an access node under the same wired network exchange, or by using the address range of a separate V5 interface, in which case the entire address range of the V5 interface is reserved for dynamic handover of subscribers as provided by the invention. In the latter case, two or more V5 interfaces have been defined between the access node and the local exchange: 1 - n interfaces for normal use for the connection of wired subscribers from the access node to the local exchange, and 1 - n V5 interfaces for subscribers to be handed over to the access node by the handover procedure according to the invention. When the subscriber is under his/her own access node, the call is set up using the subscriber's own V5/L3 address according to the V5 specifications. When the subscriber has been handed over to another access node by the handover procedure, the call is set up using a separate V5/L3 address value temporarily assigned to the subscriber in accordance with the normal V5 signalling. In other words, the subscriber has one permanent V5/L3 address of his/her own under the access node in whose area he/she mainly moves, i.e. in which the operator has defined the subscriber, and n borrowed addresses in the V5/L3 address range, depending on the cells or access nodes whose areas the subscriber is visiting. A protocol in the local exchange manages these borrowed V5/L3 addresses according to where the subscriber is handed over in each case. From the protocol's point of view, the free V5/L3 address to be borrowed can be given to any WLL subscriber defined in the local network who is to be handed over to another access node. As for the V5/L3 addresses managed by the protocol, the address may be used by any WLL subscriber defined in the local exchange. When the WLL

subscriber returns to the area of his/her own access node, the protocol releases the V5/L3 address borrowed for the subscriber, whereupon the address is free to be given to anyone who needs it. To finish the handover, the change of connection is synchronised both in the local exchange and in the access nodes, and the call first set up via the access node is disconnected in the normal manner.

On the other hand, if a call addressed to the terminal device is received while the latter is under a mobile communication network, then, using a protocol implemented in the local exchange, the wireless network data for the terminal device are determined from the access node and call setup is started from the local exchange via a signalling channel to the mobile communication network. Further, before the terminal device is handed over to the mobile communication network, the actions related to call management are carried out by the protocol implemented in the local exchange. In addition, the subscriber's right of access to the mobile communication network has to be verified. Based on this verification, handover of the terminal device to the mobile communication network is prevented if it is found that no right of access exists. Such a situation may arise if the subscriber's operator has not made a so-called roaming agreement with the operator of the mobile communication network to which the subscriber is being handed over.

Further, all actions related to call management, such as handovers to a different channel or access node, are preferably carried out or controlled by the protocol implemented in the local exchange.

In addition, in an embodiment of the invention, the right of access of the terminal device to the other base station and access node is verified, and if no right of access exists, handover of the terminal

device to that base station or access node is prevented.

Furthermore, the invention relates to a system for extending the mobility of a terminal device in a wireless local loop environment like that described above. According to the invention, the interface between the local exchange and the access node comprises a signalling channel for the transmission of information related to mobility management regarding the terminal device. The system preferably also comprises a second access node connected to the local exchange, preferably via a V5 interface, and a second base station, connected to the second access node. The interface between the local exchange and the second access node comprises a second signalling channel, which is used to transmit information related to mobility management regarding the terminal device. Further, the system comprises a third signalling channel, which has been set up in the local exchange between the first access node and the second access node and which is used to transmit information related to mobility management regarding the terminal device between the access nodes. In addition, a fourth signalling channel has been set up in the local exchange between the above-mentioned first and second signalling channels connected to a mobile communication network, said fourth signalling channel allowing direct communication between the access node and the mobile communication network.

In the following, the invention will be described by the aid of a few examples of its embodiments by referring to the attached drawing, in which

Fig. 1 is a diagram representing a system according to the present invention; and

Fig. 2 is a diagram representing another system according to the present invention.

The system depicted in Fig. 1 comprises a local exchange LE provided with a handover and roaming protocol P1 and the functions it requires. Moreover, the system comprises a first and a second access node AN, ANn, which are connected to the local exchange LE over a V5.2 interface. Connected to each access node AN, ANn is a base station BS, BSn, respectively. The coverage area of base station BS corresponds to the mobility area MA of a mobile station MS, whereas the coverage area of base station BSn defines mobility area MAn. 'Mobility area' means an area assigned to an individual WLL subscriber, within which the subscriber can normally be and move. In this application, the term can be replaced with the compound expression 'base station coverage area' or 'cell coverage area'. Thus, MA is a subscriber-specific parameter that defines the area where the subscriber can move with his/her mobile station. It is the explicit object of the invention to provide a possibility to dynamically extend the subscriber's mobility area.

Fig. 1 further illustrates the signalling in the V5 interface between the access node AN, ANn and the local exchange LE. The interface can transmit both normal PSTN signalling (PSTN, Public Switched Telephone Network) and ISDN signalling. In addition, the interface contains a channel reserved for V5 control messages (V5 ctrl) and V5 interface BCC (Bearer Channel Control) messages. Further, according to the invention, the interface comprises a signalling channel S1, S2 for the signalling of data related to handover of the mobile station MS and other mobility management data. Fig. 1 further shows a third signalling channel S3, set up between signalling channels S1 and S2 in the local exchange LE. Signalling channel S3 can be used to transmit information between the access nodes AN, ANn independently of other network components.

Next, referring to Fig. 1 in the attached drawing, a preferred embodiment of the present invention will be described. As stated above, a separate signalling channel S1, S2 has been defined in the V5.2 interface for the transmission of signalling related to mobility management regarding the mobile station MS from an access node AN consistent with the standard of the ETS 300 347 series to other access nodes or networks supporting the GSM technology. When the mobile station MS moves out of the coverage area MA of its own base station BS, which in this example is the base station BS of a WLL access node AN connected to a wired network, the access node AN asks the mobile station MS for a list of handover candidates. The access node AN transmits the information regarding the suggested base stations to the protocol P1 in the local exchange LE over signalling channel S1.

Based on the information transmitted by the access node AN, the protocol P1 in the local exchange LE selects access node ANn as the primary access node to which the mobile station MS can be handed over. If the handover operation is successful, then the local exchange LE sets up a signalling link S3 between these two access nodes AN, ANn. The access nodes AN, ANn negotiate between themselves about the necessary actions using signalling channel S3.

Once the mobile station MS has been handed over to the other access node ANn, the receiving access node ANn notifies the local exchange LE of the fact via signalling channel S2. The local exchange LE stores the information and is thus able to direct calls addressed to the mobile station MS to the correct access node ANn.

If the mobile station MS has a call going on during the handover procedure described above and if the access nodes AN, ANn have decided to hand over the call to the other access node ANn, the access node ANn

will notify the protocol P1 of the handover via signalling channel S2. The protocol P1 scans the time slots set apart from normal scanning in the V5.2 interface between the access node ANn and the local exchange to find a free time slot and sets up a call over the V5 interface of access node ANn in accordance with the specification of the ETS 300 347 series. The protocol P1 notifies the access nodes AN and ANn via signalling channels S2 and S1 of the call set up. The protocol P1 receives from both access nodes AN, ANn a message indicating that they are ready for the transfer of the speech path and synchronises the change of connection both in the local exchange LE and in the two access nodes AN, ANn. The call originally set up via access node AN is disconnected from the V5 interface in accordance with the specification of the ETS 300 347 series under control of the protocol P1.

Similarly, the system presented in Fig. 2 comprises a local exchange LE provided with a handover and roaming protocol P1 and the functions it requires. Moreover, the local exchange is provided with a subscriber database DB, which is used to store the required information about the subscribers, such as the mobility area defined for each subscriber. The system further comprises an access node AN connected to the local exchange LE via a V5.2 interface. Connected to the access node AN is a base station BS, whose coverage area in this example corresponds to the mobility area MA defined for a mobile station MS.

Fig. 2 further illustrates the signalling in the V5 interface between the access node AN and the local exchange LE. The interface can transmit both normal PSTN signalling (PSTN, Public Switched Telephone Network) and ISDN signalling. In addition, the interface contains a channel reserved for V5 control messages (V5 ctrl) and V5 interface BCC (Bearer Channel Control) messages. Further, according to the in-

vention, the interface comprises a signalling channel S1 for the signalling of data related to handover of the mobile station MS and other mobility management data. The drawing further shows a second signalling channel S2 from the local exchange LE to a mobile switching centre MSC. Signalling channel S2 can be used to transmit information about the subscriber between the local exchange and the mobile switching centre. In addition, the system presented in the drawing comprises a third signalling channel S4, set up in the local exchange between signalling channels S1 and S2.

Furthermore, Fig. 2 illustrates the structure of a mobile communication network, which is known in itself; suffice it to say that the access node of a wireless local loop corresponds to both an MSC and a BSC, which in Fig. 2 are inside a box ANn depicted with broken lines.

Next, referring to Fig. 2, another preferred embodiment of the present invention will be described with reference to a situation that arises when a mobile station MS is only able to set up radio communication with a base station BSn functioning under a mobile communication network and in which a WLL subscriber originally belonging to a wired telephone network is dynamically installed as a subscriber in a local GSM system.

When the subscriber's station MS, connected by a wireless technique to the local exchange LE in the wired telephone network, moves out of the coverage area MA of its own base station, the WLL access node AN functioning under the wired-network local exchange LE sends via the signalling channel S1 added to the V5.2 interface a signal to the protocol software P1 in the local exchange LE, indicating that the subscriber's station MS has moved out to a low-field area.

The protocol software P1 in the local exchange LE examines the information sent by the access node

AN and the mobile station MS and compares it with the limit values defined by the operator. If the protocol software P1 decides to hand over the subscriber to the GSM network, it sends via signalling channel S2 a message to the home location register HLR in the mobile switching centre MSC of the GSM network to inform it of the subscriber to be handed over. If the home location register HLR accepts the offered subscriber, it sends corresponding information to the protocol software P1 in the local exchange LE, whereupon the protocol software sets up a signalling channel S4 in the local exchange between signalling channels S1 and S2.

The home location register HLR in the switching centre of the GSM system sends the access node AN under the wired-network local exchange LE a request asking for the radio network-specific data regarding the mobile station MS and registers the subscriber as a temporary subscriber in its own system. To finish the handover, the home location register HLR informs the protocol software P1 in the local exchange LE that the subscriber is temporarily under the global GSM network. Based on this notice, the protocol software P1 enters a marking against the subscriber in the subscriber database DB, indicating that the subscriber is temporarily under the GSM network.

If a call addressed to the subscriber is received in the wired-network local exchange LE, the call control system learns from the subscriber data DB that the subscriber's station is outside the range of its own access node AN. The call control system of the local exchange LE hands over the call management to the protocol software P1, which then sends the access node AN a request asking for the radio network-specific information regarding the subscriber. After receiving this information, the protocol P1 starts call setup over signalling channel S2.

If there are two or more GSM operators active in the same geographic area, the subscriber may select him/herself the operator to which the call is to be handed over in a roaming situation, provided that the operator of the subscriber's home network has made a roaming agreement with the respective operator.

The invention is not restricted to the examples of its embodiments described above, but instead many variations are possible within the framework of the inventive idea defined by the claims.

CLAIMS

1. Procedure for extending the mobility of a mobile station (MS) in a wireless local loop environment which is based on technology used in a mobile communication system and which comprises a local exchange (LE), a first access node (AN) connected to the local exchange, a mobile station (MS) and a base station (BS) connected via the access node to the local exchange and used to transmit call signals between the access node and the mobile station (MS), in which the home network and mobility area (MA) of the mobile station are defined by means of the base station and the associated access node and in which there are a number of base stations (BSn) of other networks disposed in the environment of the local loop, the mobile station receiving information signals from the surrounding base stations and, based on these information signals, determining the base station with which the mobile station is communicating, characterised in that a signalling channel (S1) is set up in the interface between the local exchange (LE) and the access node (AN) and this channel is used for the transmission of information related to mobility management regarding the mobile station; and that when the mobile station moves out of its mobility area (MA),

another base station (BSn) with which the mobile station is able to establish radio communication is determined on the basis of information given by the mobile station,

the mobile station is handed over to the other base station, and

the handover is registered in the local exchange (LE) of the home network.

2. Procedure as defined in claim 1, characterised in that the other base station (BSn) prima-

rily communicates with another access node (ANn) connected to the local exchange (LE).

3. Procedure as defined in claim 1 or 2, characterised in that, if the other base station (BSn) with which the mobile station is able to establish radio communication belongs to a mobile communication network, then

the radio network-specific information for the mobile station is given to the mobile communication network; and

the mobile station is installed as a temporary subscriber in the mobile communication network, thus allowing the mobile station to be used in the mobile communication network according to its normal definitions.

4. Procedure as defined in any one the preceding claims 1 - 3, characterised in that a signalling channel (S2) is set up between the local exchange and the mobile communication network and/or in the V5 interface between the local exchange (LE) and the other access node (ANn), and this channel is used for the transmission of information related to mobility management regarding the mobile station (MS).

5. Procedure as defined in any one the preceding claims 1 - 4, characterised in that the information given by the mobile station (MS) comprises a list of those base stations (BSn) to which the terminal device is able to perform a handover according to the specifications for the mobile communication network.

6. Procedure as defined in any one the preceding claims 1 - 5, characterised in that, in the local exchange (LE), a signalling channel (S3) is set up between the first access node (AN) and the second access node (ANn) for the transmission of signalling between the access nodes.

7. Procedure as defined in any one the preceding claims 1 - 5, characterised in that, in the local exchange (LE), a signalling channel (S4) is set up between the first access node (AN) and the mobile communication network for the transmission of signalling between the access node and the mobile communication network.

8. Procedure as defined in any one the preceding claims 1 - 7, characterised in that, if the mobile station has a call going on at the time of the handover between the access nodes (AN, ANn), then

the local exchange (LE) is informed of the handover of the mobile station via signalling channel (S2);

the time slots in the interface between the second access node (ANn) and the local exchange are scanned to find a free time slot and a call is set up over the interface in the normal manner;

the access nodes (AN, ANn) are notified of the call set up;

the local exchange is informed that both access nodes (AN, ANn) are ready for the transfer of the speech path and the change of connection is synchronised both in the local exchange and in the access nodes; and

the call originally set up via access node (AN) is disconnected in the normal manner.

9. Procedure as defined in any one the preceding claims 1 - 7, characterised in that if a call addressed to the mobile station is received while the latter is under a mobile communication network, then

the radio network-specific information for the mobile station is determined from the access node (AN); and

call setup is started from the local exchange (LE) via signalling channel (S2) to the mobile communication network.

10. Procedure as defined in any one of the preceding claims 1 - 9, characterised in that, before the mobile station (MS) is handed over to the mobile communication network, the actions related to call management are carried out by means of a protocol (P1) provided in the local exchange.

11. Procedure as defined in any one of the preceding claims 1 - 10, characterised in that the mobile station's (MS) right of access to the second access node (ANn), to the second base station (BSn) and/or to the mobile communication network is verified; and handover of the mobile station to them is prevented if it is found that no right of access exists.

12. Procedure as defined in any one of the preceding claims 1 - 11, characterised in that the interface between the local exchange (LE) and the access node (AN, ANn) is a V5 interface consistent with standard ETS 300 series 347.

13. System for extending the mobility of a terminal device in a wireless local loop environment, which is based on technology used in a mobile communication system and which comprises a local exchange (LE), a first access node (AN) connected to the local exchange, a mobile station (MS) and a base station (BS) connected via the access node to the local exchange and used to transmit call signals between the access node and the mobile station, in which the home network and mobility area (MA) of the mobile station are defined by means of the base station and the associated access node, characterised in that the interface between the local exchange (LE) and the access node comprises a signalling channel for the transmission of information relating to mobility management regarding the mobile station.

14. System as defined in claim 13, characterised in that the system comprises a second access

node (ANn) connected to the local exchange (LE) and a second base station (BSn) connected to the second access node or to the mobile communication network; and that the interface between the local exchange (LE) and the second access node comprises a second signalling channel (S2), which is used to transmit information relating to mobility management regarding the mobile station (MS).

15. System as defined in claim 13 or 14, characterised in that the system comprises a third signalling channel (S3), set up in the local exchange (LE) between the first access node (AN) and the second access node (ANn), and a fourth signalling channel (S4), set up in the local exchange (LE) between the first access node (AN) and the mobile communication network and used to transmit information related to mobility management regarding the mobile station (MS) between the access nodes and/or the first access node and the mobile communication network.

16. System Procedure as defined in any one of the preceding claims 13 - 15, characterised in that the interface between the local exchange (LE) and the access node (AN, ANn) is a V5 interface consistent with standard ETS 300 series 347.

17. System Procedure as defined in any one of the preceding claims 13 - 16, characterised in that the system comprises a dynamically definable V5/L3 address range disposed in a separate V5 interface and/or set apart from the address range of a predetermined V5 interface.

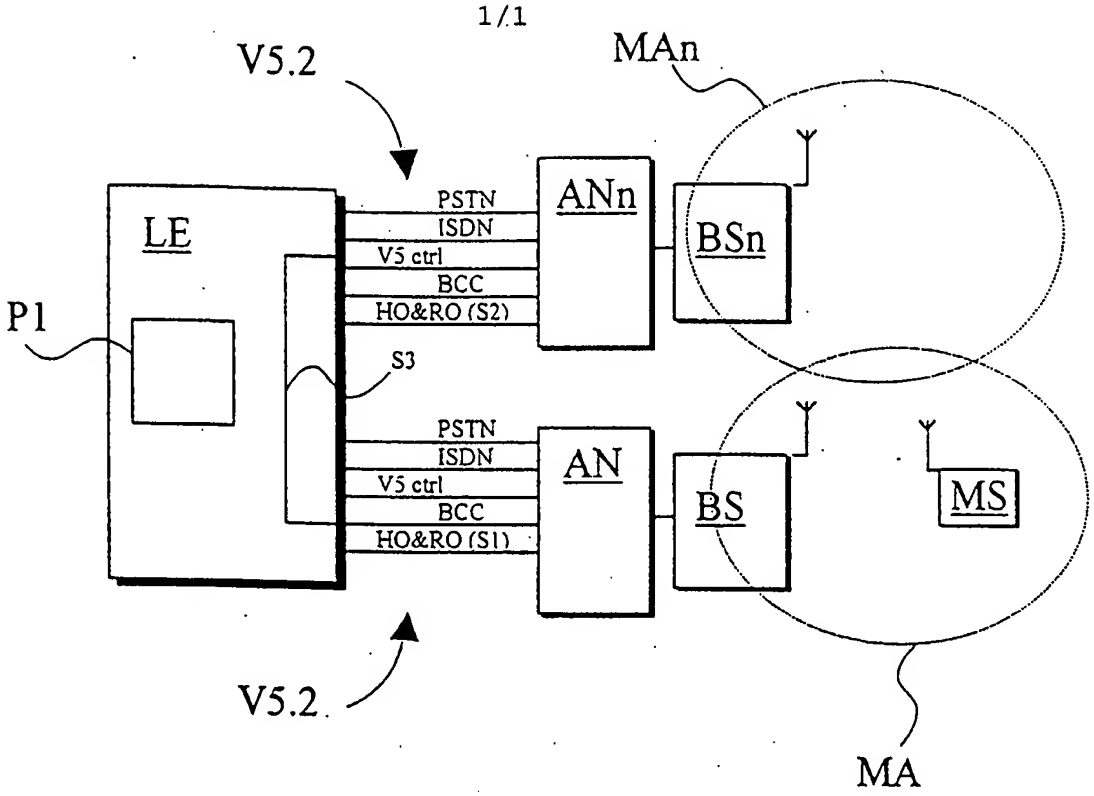
V5.2
MAn
LE
P1
PSTN
ISDN
V5 ctrl
BCC
HO&RO (S2)
ANn
BSn
S3
PSTN
ISDN
V5 ctrl
BCC
HO&RO (S1)
AN
BS
MS
V5.2
MA

Fig 1.

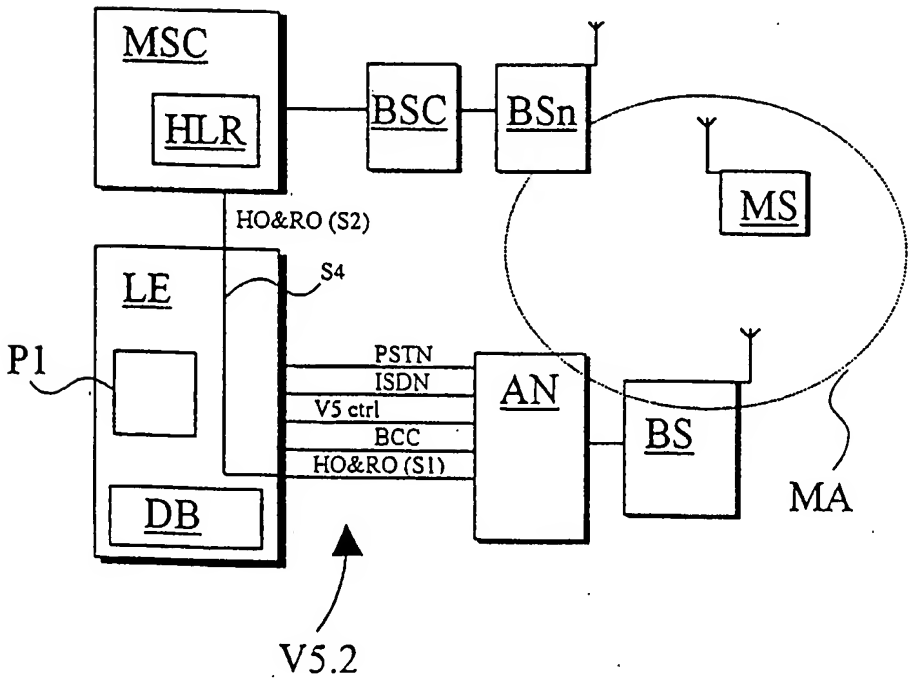
MSC
HLR
BSC
BSn
MS
HO&RO (S2)
LE
S4
P1
PSTN
ISDN
V5 ctrl
BCC
HO&RO (S1)
AN
BS
DB
MA
V5.2

Fig 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 98/00070

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04Q 7/38
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	US 5325419 A (DAVID A. CONNOLLY ET AL), 28 June 1994 (28.06.94), column 11, line 43 - line 63	13
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[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 July 1998	31 -07- 1998
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Göran Petersson Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 98/00070

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	FREQUENCE, Volume 48, No 1-2, 1994, Karim Khakzar, "V5 Interfaces between Digital Local Exchanges and Access Networks", page 44 - page 50, see the whole article	1-17

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PCT/FI 98/00070

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10/5/2007, EAST Version: 2.1.0.14

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PCT/FI 98/00070

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